PRV

PATENT- OCH REGISTRERINGSVERKET
Patentavdelningen

PCT / SE 2004 / 000497

Intyg
Certificate

Härmed intygas att bifogade kopior överensstämmer med de handlingar som ursprungligen ingivits till Patent- och registreringsverket i nedannämnda ansökan.

This is to certify that the annexed is a true copy of the documents as originally filed with the Patent- and Registration Office in connection with the following patent application.

PATENT- OCH REGISTRERINGSVERKET

(71) Sökande / Applicant (s) — *Printdreams Europe AB, Kista SE*

REC'D 20 APR 2004
WIPO PCT

(21) Patentansökningsnummer / Patent application number — *0300913-1*

(86) Ingivningsdatum / Date of filing — *2003-03-31*

BEST AVAILABLE COPY

Stockholm, 2004-04-01

För Patent- och registreringsverket
For the Patent- and Registration Office

Marita Öun

Marita Öun

Avgift
Fee

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

Method for navigation with optical sensors, and a device utilizing the method

TECHNICAL FIELD OF THE INVENTION

The present invention relates to a method for optical navigation on a surface using at least one optical sensor, especially but not necessarily related to navigating a portable printer on a print medium. The invention also relates to a device utilizing this method.

DESCRIPTION OF RELATED ART

Hand-held and hand-operated printing devices with an inkjet print head are known through various documents.

US patent No. 5,927,872 by Yamada (Hewlett Packard) discloses a system and a method of printing an image represented by a frame of image data utilizing a hand-held printer having optical sensor means for tracking positions of the hand-held printer relative to a surface of a print medium during a printing process. It is monitored in real time using navigation information generated by the optical sensor.

Each optical sensor comprises an array of opto-electronic elements to capture images of the surface of a print medium at fixed time intervals. Preferably, the optical sensor means can detect slight pattern variations on the print medium, such as paper fibres or illumination pattern formed by highly reflective surface features and shadowed areas between raised surface features. These features can then be used as references for determining the position and the relative movement of the hand-held printer.

In one embodiment, the hand-held printer contains a navigation processor and a printer driver. Using the printer driver, the

navigation processor drives the hand-held printer to print segments of the image onto a print medium as the hand-held printer travels across the print medium to form a composite of the image.

In the international application WO 01/74598 A1, a hand-held printer in shape of a pen is shown. The printer writes on a special paper having an absolute and unique pre-printed pattern. An image sensor inside the printer records an image of the paper. The printer is adapted to convert the recorded image into at least one recorded position in the form of two coordinates. In that way, the printer always knows its exact position and is able to print an image stored in a memory inside the printer. This printer consequently needs a paper with a certain pattern to be able to operate and a processor adapted for pattern recognition.

One reason for having a pre-printed paper is that it improves and facilitates navigation and positioning of the print head and thereby also enhances the printing quality. The positioning without special paper is hence a difficult technique to master when developing hand-held printers that are swept over the print medium with hand movements, to form an image.

The printout should preferably be possible to accomplish also on any print medium and should not be restricted to any paper with a pre-printed pattern.

US 5,644,139 (Allen et al.) shows a scanning device and method for forming a scanned electronic image that includes using navigation information that is acquired along with image data, and then rectifying the image data based upon the navigation and image information. The navigation information is obtained in frames. The differences between consecutive frames are detected and accumulated. To avoid the accumulation of errors, the

accumulated displacement value obtained from consecutive frames is updated by comparing a current frame with a much earlier frame stored in a memory and using the resulting difference as the displacement from the earlier frame. These larger displacement steps are then accumulated to determine the relative position of the scanning device.

The navigation information is acquired by means of at least one navigation sensor that detects inherent structure-related properties of the surface.

The navigation acquires sample frames with a duration of dt, where dt is chosen small enough for the scanning device not to move more than one pixel at maximum. The sensor then detects which; out of eight different possible movements to a neighbour pixel that have taken place, if any. Correlations are used to find the locations of identical features in successive frames in order to determine the displacements of the features from frame-to-frame. These correlations are called microsteps and frame rates are chosen to be sufficiently high to ensure that the displacements do not exceed the dimension of a single pixel.

To avoid errors that will accumulate during said microsteps, a sample frame is stored in a separate buffer memory. This separately stored sample frame becomes a new reference frame for a subsequent series of correlation computations, referred to as macrostep.

One basic problem faced when developing a mobile printer navigating on a printout surface is to find optical sensors with the precision or the stability needed for the navigational algorithms so to avoid smudged, uneven and otherwise distorted printouts.

It is an object of the present invention to provide an optical sensor with the level of performance needed for extreme high-speed real time applications.

It is also an object of the invention to provide a sensor with the ability to reduce the number of macrosteps in order to reduce the total error.

SUMMARY

It is an object of the present invention is to overcome the abovementioned problems by providing a method where optical sensors mounted on a device in a real time process obtain a very high accuracy by reducing the number of macrosteps/recaptures and further showing a technique to minimize the error given at each macrostep.

This object is achieved, according to a first aspect of the invention, by a method for navigation on a surface using at least one optical sensor comprising a image sensor, set to capture consecutive images of said surface during movement, each image being compared to a previous, the distance between the captures being accumulated in order to update the position of said sensor. Furthermore, an observation frame is stored in a memory as a reference and in a procedure of tracing the motion of this particular region of the surface around the sensor's field of view, prediction based e.g. on regression and extrapolation is used to anticipate where to find said region/observation frame at the next captured image. A number of mathematic methods for prediction is conceivable to use at this stage, however regression and extrapolation is used in a preferred embodiment.

In a preferred embodiment two sensors are mounted on a handheld printer. The position updates then comprise an x- and a y-coordinate and an angle of rotation of the printer device.

In accordance with one embodiment of the invention, every new image is correlated with a so-called *current observation frame* after juxtaposition and rotation of the images. The image is moved around the predicted position to find out and compare which position has the highest correlation with said current observation frame.

In accordance with yet another embodiment of the invention, a new observation frame is captured in the field of view of the sensor as the current image approaches the edge of a sensor's field of view or if the rotation angle has exceeded a predetermined threshold. Normally this means that when the current stored observation frame starts to closing in at the edge of the sensor's field of view, there is a need to capture a new observation frame to follow during subsequent captures of images.

Since the only error that can occur with this technique will occur when shifting from a current observation frame to a new observation frame, there is a need to handle this position update with greatest care. Therefore according to yet another embodiment of the invention the new observation frame is captured and stored before it actually serves as the current observation frame. After the capture of the new observation frame, the old/current is still used for a couple of exposures in order to improve the position update which took place during the capture of the new observation frame by interpolating this value with previous and subsequent values. This is to get a more exact positioning of the sensor or the device before a switch where the new observation frame could start to act as the current observation frame.

The use of said interpolation technique at the time of recapture of a new observation frame, together with the actual following of a certain area of the surface leads to a very high accuracy

in position determination. By choosing a relative large area for the sensor's field of view reduces the number of recaptures and by choosing a small area for the observation frame reduces the risk of finding a secondary correlation maximum at the same time as entails faster calculation.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the invention believed to be novel are set forth with particularity in the appended claims. The invention itself however, both as to organisation and method of operation, together with further objects and advantages thereof, may be best understood by reference to the following description with the accompanying drawings, in the several Figures in which:

- Fig. 1 illustrates a perspective view in section of a printing device equipped with a pair of optical sensors,
- Fig. 2 illustrates a perspective view from underneath of the same printing device,
- Fig. 3 illustrates a block diagram describing a method for navigation using optical sensors according to the present invention and
- Fig. 4 illustrates an interpolation method in an x-y-diagram.

DETAILED DESCRIPTION OF EMBODIMENTS

Referring now in detail to the drawings and initially to Fig. 1 and 2, there is shown a mobile printer equipped with a pair of optical sensors 3 with an inkjet head 2 designed to provide a compact portable printing device in order to enable a user to print from small portable devices such as a cellular phone, a portable PC, a personal digital assistance (PDA) or the like,

and other portable electronic devices or for electronic stamping, printing of small texts, tags, addresses, cutting and clipping. By fixing a print-head in a construction plate 9 where one or more positioning sensor means are fixed as well, it is possible to obtain a geometrical construction with an x- and y- coordinate system and to establish, with great mathematical accuracy, the coordinates x and y for each individual ink-jet opening/nozzle in the print-head.

The coordinates, during a time frame, constitute the grounds for an accurate and precise spraying of ink-drops onto a printing surface according to a predetermined printing design.

Fig 1 and 2 illustrates a hand operated printing device composed by a construction/design body 1 and a print-head 2 which interact with one or more optical positioning sensor means 3, a micro controller circuit 4, a communication unit 5 to transmit the data, one or more command buttons 6, a control screen, and a source of energy, in this case a battery 8. The mobile printer and its features will not further be described since the present invention focuses merely on the optical sensors. However, the functionality of the mobile printer is thoroughly described in the International Publication WO 03/006244 from the same applicant and hereby incorporated by reference.

The optical sensors in a printer device such as above consequently needs to be very accurate and the hardware/software controlling the navigation needs to have a very high real time performance in order to process the navigation information and thereafter send commands to the printhead.

An optical sensor, herein described, is therefore developed to meet this requirement. It is to be noted that the optical sensor shown is not limited to a printing device (hereafter called "the

device"), but could naturally be used in all possible applications in all types of devices where an accurate navigation on any surface is needed.

However, in the preferred embodiment with the mobile printer device, two sensors are needed to take account for a possible rotation of the device during a print out sweep by a user. A user that moves the printer over any printout surface tends to form a rotating movement around his elbow. It is though to be understood that the method of navigation by optical sensors described herein is not limited to the use of exactly two sensors, but will also function with a single sensor or a larger number of sensors.

The invention will not deal with the physical construction of the sensor, but rather software based methods for navigation on a surface. This application is therefore not limited to any special type of optical sensors. However, in an environment where the device carrying the sensors according to the invention is a mobile printer, a telecentric lens would be preferred since that makes the sensor more insensitive to vertical variations on the printing surface.

The navigation procedure envisaged is as follows: A CMOS matrix of 640X480 pixels is used in a preferred embodiment for each of the two sensors. Initially a reference frame is captured in the center of both sensors' field of view. A frame is an image of 24X24 pixels and will from here be called the "observation frame". The size of the CMOS matrix and the observation frame could of course be chosen differently, but in this example these will be the sizes used.

As a device with the sensors mounted on is moved around the surface, subsequent images are captured at equal time intervals dt. The distances covered between the moment the reference frame

was captured and the moment of the latest captured image in both sensors, together with the angle between the two radius vectors, yield the position and the orientation of the device at every exposure. This is the so-called *normal capture* procedure, described further below.

From time to time there is a need to capture a new reference frame, the so-called *recapture* procedure, also described below.

Normal capture: Normal capture is the procedure of tracing the motion of a particular region of the paper surface around a sensor's field of view (here 640 X 480 pixels, but can of course have other dimensions) between sequential exposures. The reference observation frame is preferably but not necessary captured in the center of the field. Each observation frame is in the preferred embodiment 24 x 24 pixels and in the worst case (motion in one direction along the short side of the field view) there will be at least dozens of normal captures until the current image reaches the edge of the field and a recapture of a new reference observation frame is needed.

Note that each normal capture and the associated distance calculation are independent, so there is no error accumulation during this stage.

The distances covered between the moment the reference frame was captured and the moment of the latest captured image is obtained using a procedure of correlation analysis of images.

It is predicted by a correlation function where to find said particular region between two observation frames by taking images at this predicted position, based upon regression and extrapolation of previous values of x, y and theta, where theta is the angle for the device. The distance between two consecutive observation frames is naturally dependent on the

capture frequency, speed and acceleration of the device, but also of any possible rotation. The distance could in this preferred embodiment be several pixels. Having an adequate correlation function predicting where to find the current observation frame from one exposure to the other, means that the capture frequency does not have to be so high that the maximum allowed distance of movement between two captures has to be maximum one pixel as in the prior art. A correct correlation function will "find" the particular region even though the distance might be several pixels. This is due to the nature of a sweeping movement by a human hand that cannot alter the acceleration or rotation notably between two successive captures.

Each new image is compared to the reference image by correlating the new image with the reference image at a number of positions around the predicted position and find out which position that has the highest correlation. In a preferred embodiment the maximum of the correlation function is determined by moving the central pixel region of the 24 X 24 pixel observation frame around the predicted position, after juxtaposition and rotating the two images, to find out which position has the highest correlation. Choosing such a small observation frame as 24 X 24 pixels is advantageous e.g. for avoiding to find a secondary maximum.

The most likely position of the maximum is hence predicted from the history to determine the velocity and direction of the device. The error of the prediction consists of the regression error and the error due to acceleration of the device during the interval between exposures. This central pixel region of the observation frame, referred to as the "central observation frame area", could of course vary according to any suitable size, but

as an example, a 14 X 14 central observation frame area could be suitable in a 24 X 24 pixel observation frame.

To complete the analysis one needs to consider the effects of rotation on the correlation function. Rotation in general is a problem, because the light source rotates together with the device, and so do the shadows and the lit spots on the surface of the paper. However, it is immediately clear that rotation is very small between subsequent exposures. A rotation of one degree between exposures at preferred frequency would correspond to about three full rotations/second and that is not a likely speed of rotation expected from the normal user.

Nevertheless, to take proper account of rotation the reference image is rotated before juxtaposition with the current frame. This could be achieved using the following procedure: When the reference image is captured there is nothing to correlate it with, so the extra cycles are spent on adding some more points to the image. The actual reference matrix could e.g. contain three times as many points as the normal 24 X 24 observation frame; let's say a 70 X 70 frame. When needed, the central observation frame area is rotated and the brightness function is interpolated from the 70 X 70 matrix.

<u>Recapture</u>: When the current image approaches the edge of a sensor's field of view, a new observation frame is captured in the field of view of the sensor. This will happen e.g. when the device has moved too far from the stored current/old observation frame or when the rotation of the device has changed more than a predetermined threshold. New reference images are preferably taken for the two sensors simultaneously for symmetrical reasons.

The motion history could be used for analysing and predicting the most advantageous (from the point of view of the longest

time to next recapture) position for the new observation frame. This should normally be at the edge of the sensors view so the reference frame could travel through the whole area of the sensor before next recapture must take place. The goal must of course be to reduce the number of recaptures to minimise accumulated errors.

When a new observation frame is captured it is preferable to use the old/current reference observation frame for a couple of more exposures to make position prediction more accurate after the system switches to the new reference. This will be described more thorough later.

Fig 3. illustrates an embodiment of a navigation algorithm diagram for software in combination with an optical sensor according to the invention.

Initially when placing the device comprising sensors according to the invention on a surface an initialisation procedure 20 takes place as seen in blocks 21-24. The system will understand that the there is no movement since the initial exposures will be taken on exact the same spot. All variables could then be set to zero. As soon the surface starts to move with respect to the sensor, the normal mode 30 is entered.

The normal mode 30 of capturing frames where the major task of navigation is carried out, i.e. to produce the "current" coordinates (x,y) and the angle (theta) for the device is illustrated in 31-35. This is done by taking images 32 at a predicted position, to find the pattern of the current observation frame, the position being based upon regression and extrapolation of previous values of x,y and theta 31. An update of the device position is hereby obtained 33 after each image capturing by accumulating the x-, and y-coordinates.

In order to predict when we are closing in on the outer boundaries of the field of view of the sensor a position of the current observation frame a couple of frames ahead is calculated 34 to see if a recapture is needed 35. The exact number of frames ahead used, is of course optional and could be set for each individual use.

In an alternative embodiment, the condition for a recapture could be set to be initialised when the observation frame is closing in to a predefined area of the sensor (rather than the edge of the sensor), which is not reliable in terms of having perfect optical properties. This is advantageous when having a sensor with inbuilt irregularities where, e.g. only the central part of the sensor is reliable in optical performance due to e.g. an imperfect lens.

The recapture process 40 starts with an estimation of the *next* position 41 of the device by extrapolation from previous positions and initiating the sensor to capture and store a new observation frame somewhere in the sensor's field of view at that predicted position 42. Said new observation frame could be chosen as said at an edge of the sensor's field of view or in any other place within sensor's limits, e.g. at the centre.

From a hardware point of view the *new* reference images/observation frames are captured and stored in a dedicated buffer, i.e. in a buffer that is not the "current" buffer. Note that the current reference images/observation frames remain unchanged at this point, and will be used at a few more captures. The exact number of times is of course optional. Said technique is used since the problem with the new observation frame is that its exact location is not known; instead it can only be extrapolated from previous positions. Therefore to make a better estimate of the exact location of the new observation

frame, the *current* observation frame is used to get a few more positions.

As can be seen this technique is visualized in Fig 4. an example is given where no exact position for the time when the new observation frame was taken (T_{-2}), since in this example that clock cycle is occupied with capturing the new observation frame. In the next clock cycle the current observation frame is again searched for and when it is found this position update could be used together with later and earlier position updates to interpolate and get a better position update for the device's position during the "lost" clock cycle while the new observation frame was taken.

Consequently, in order to make a more exact determination of the new reference image position, interpolation is used, based on the positions surrounding it, i.e. (T_0, T_{-1}, T_{-3}, T_{-4} etc). Once this calculation has been done and when the system decides that a change to the new observation frame is needed, the current observation frame is replaced by the new observation frame. Hence, the *new* observation frame will now serve as the *current* observation frame.

By going back to Fig. 2 we see the same thing described above in the block diagram where frame 44-47 describes the interpolation procedure with a loop where it is obvious that the current observation frame still is used until a change is needed, even though a new observation frame has already been captured and stored. The switch from the *current* observation frame to the *new* observation frame then takes place 49 when the device position has been recalculated 48 and the algorithm controls the sensors back to normal capture mode 30. This mode is then continued until the new observation frame closes in to the outer limit of the sensor's field of view or until the rotation exceeds the predefined threshold.

<u>Fast recapture:</u> If the navigation was not capable to determine the position of the last captured image, i.e. the correlation function failed to find the observation frame, a new observation frame is captured and is used at once without the substates handling and interpolation that is done according to previous paragraphs. In this case the position of the new observation frame is set at the estimated position through regression from the history of the previously known positions.

It is preferable to calibrate the optics before using it in the sensor in order to obtain a higher precision and reduce distortion due to imperfectness of the optics. Hence, by using calibration data to compensate for non-perfect optics confer a higher precision of the navigation.

CLAIMS

1. A method for navigation on a surface using at least one optical sensor comprising an image sensor set to capture consecutive images of said surface during movement, each image being compared to a previous, the distance between the captures being accumulated in order to update the position of said sensor, c h a r a c t e r i z e d in that an observation frame is stored in a memory as a reference and that each subsequent image is compared with a current observation frame in a procedure of tracing the motion of a particular region of the surface around said image sensor's field of view between sequential exposures, finding said particular region at each exposure by taking images at a predicted position.

2. A method for navigation on a surface using at least one optical sensor according to claim 1, c h a r a c t e r i z e d in that said predicted position is identified with at least a horizontal and a vertical coordinate and a rotation angle.

3. A method for navigation on a surface using at least one optical sensor according to claim 2, c h a r a c t e r i z e d in that two of said optical sensors are mounted on a handheld printer device and that said rotation angle defines the rotation of said device.

4. A method for navigation on a surface using at least one optical sensor according to claim 2 or 3, c h a r a c t e r i z e d in that each new captured image is compared to said current observation frame after juxtaposition and rotation of the images.

5. A method for navigation on a surface using at least one optical sensor according to any of claims 1 to 4, c h a r a c t e r i z e d in that each new image is compared to said current

observation frame by correlating the new image with the current observation frame at a number of positions around the predicted position to find out which position that has the highest correlation.

6. A method for navigation on a surface using at least one optical sensor according to claim 1, c h a r a c t e r i z e d in that a new observation frame is captured in the field of view of the sensor as the captured images approaches the edge of a sensor's field of view or if the rotation angle has exceeded a predetermined threshold.

7. A method for navigation on a surface using at least one optical sensor according to claim 6, c h a r a c t e r i z e d in that the new observation frame is captured at that edge of the field of view of the sensor which provides the longest predicted elapsed time to when next recapture must be done.

8. A method for navigation on a surface using at least one optical sensor according to claim 6, c h a r a c t e r i z e d in that the new reference observation frame is captured in the centre of the sensor's field of view.

9. A method for navigation on a surface using at least one optical sensor according to claim 6, c h a r a c t e r i z e d in that the current observation frame serves as reference observation frame for one or a few additional exposures after a new observation frame has been captured and stored.

10. A method for navigation on a surface using at least one optical sensor according to claim 9, c h a r a c t e r i z e d in that the position is estimated by extrapolation from earlier position updates as said new reference observation frame is captured and that subsequently during said few additional exposures the position is determined and updated by interpolation based on position updates before and after the

moment the new observation frame was captured; thereafter the new observation frame is allowed to serve as current observation frame.

11. A method for navigation on a surface using at least one optical sensor according to claim 6, c h a r a c t e r i z e d in that a new observation frame is captured and used as current observation frame immediately if the position determination for the last captured image fails.

12. A device navigating on a surface by using at least one optical sensor comprising an image sensor set to capture consecutive images of said surface during movement, each image being compared to a previous, the distance between the captures being accumulated in order to update the position of said sensor, c h a r a c t e r i z e d in that said device comprises a memory in which an observation frame is stored as a reference image and that said device is arranged to compare each subsequent image with a current observation frame in a procedure of tracing the motion of a particular region of the surface around said image sensor's field of view between sequential exposures, finding said particular region at each exposure by taking images at a predicted position.

ABSTRACT

A method for navigation and positioning with optical sensors moving over a surface. The sensors light up the surface and capture consecutive images. A reference image of a small area of the image is stored and the sensor follows said are in the sensor's field of view by predicting where to find said area from one capture to another. The prediction is based on regression and extrapolation. When the image closing in on the edge of the sensor's field of view a new reference image is captured and stored. Before the new reference image is used as reference, the position is updated using interpolation. The invention also relates to a device using said method.

Figureforpublication:3

PRV03-03-31

1/5

Fig. 1

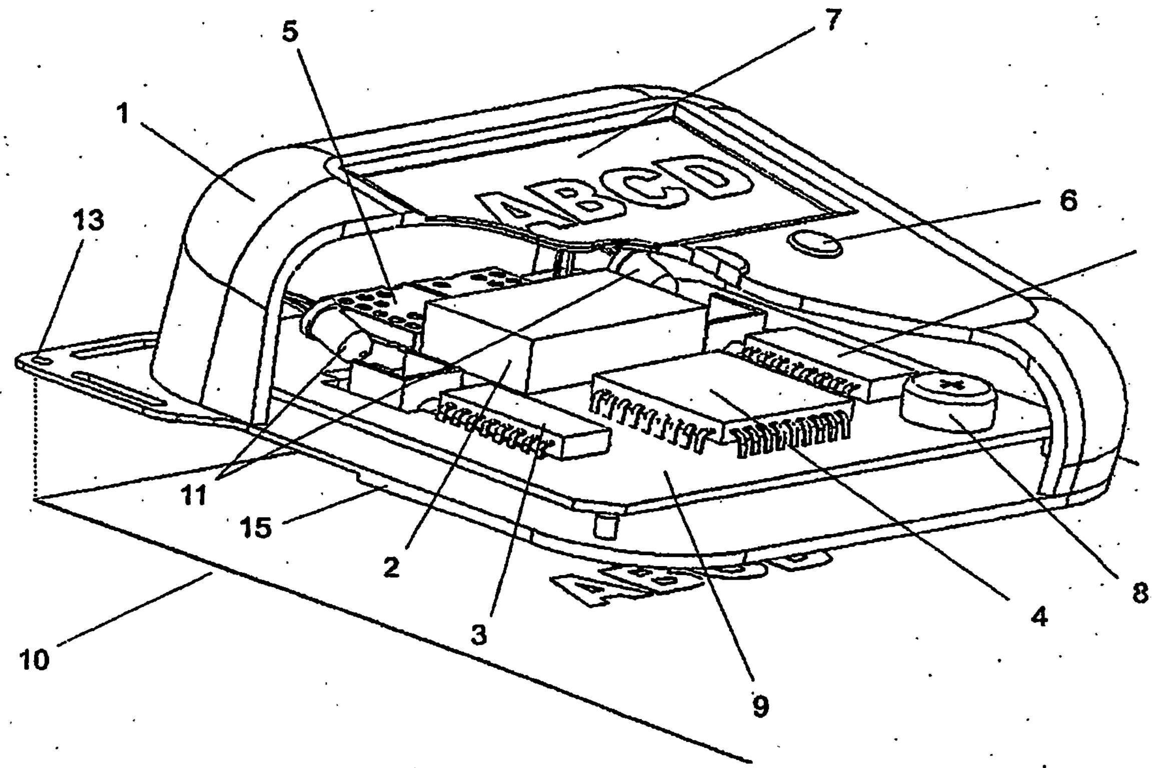
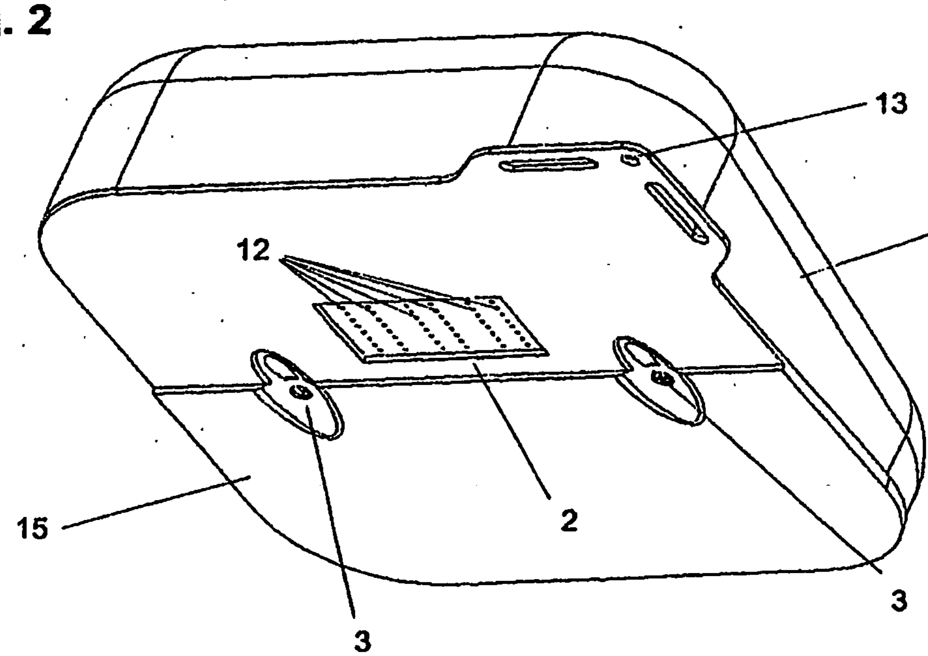


Fig. 2



0200312-1

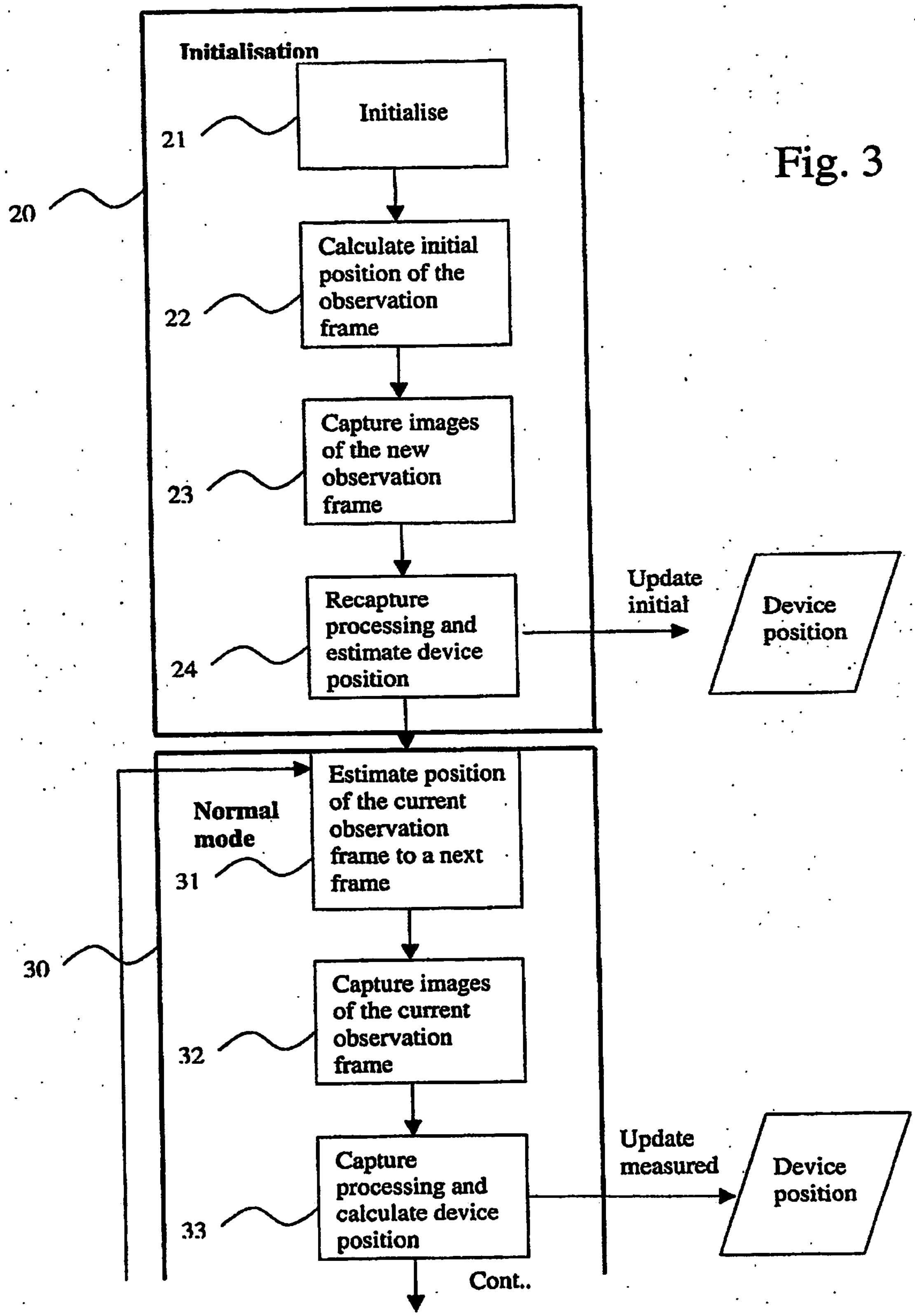

Initialisation
Initialise
21
20
Calculate initial position of the observation frame
22
Capture images of the new observation frame
23
Recapture processing and estimate device position
24
Update initial
Device position
Estimate position of the current observation frame to a next frame
Normal mode
31
30
Capture images of the current observation frame
32
Capture processing and calculate device position
33
Update measured
Device position
Cont..

Fig. 3

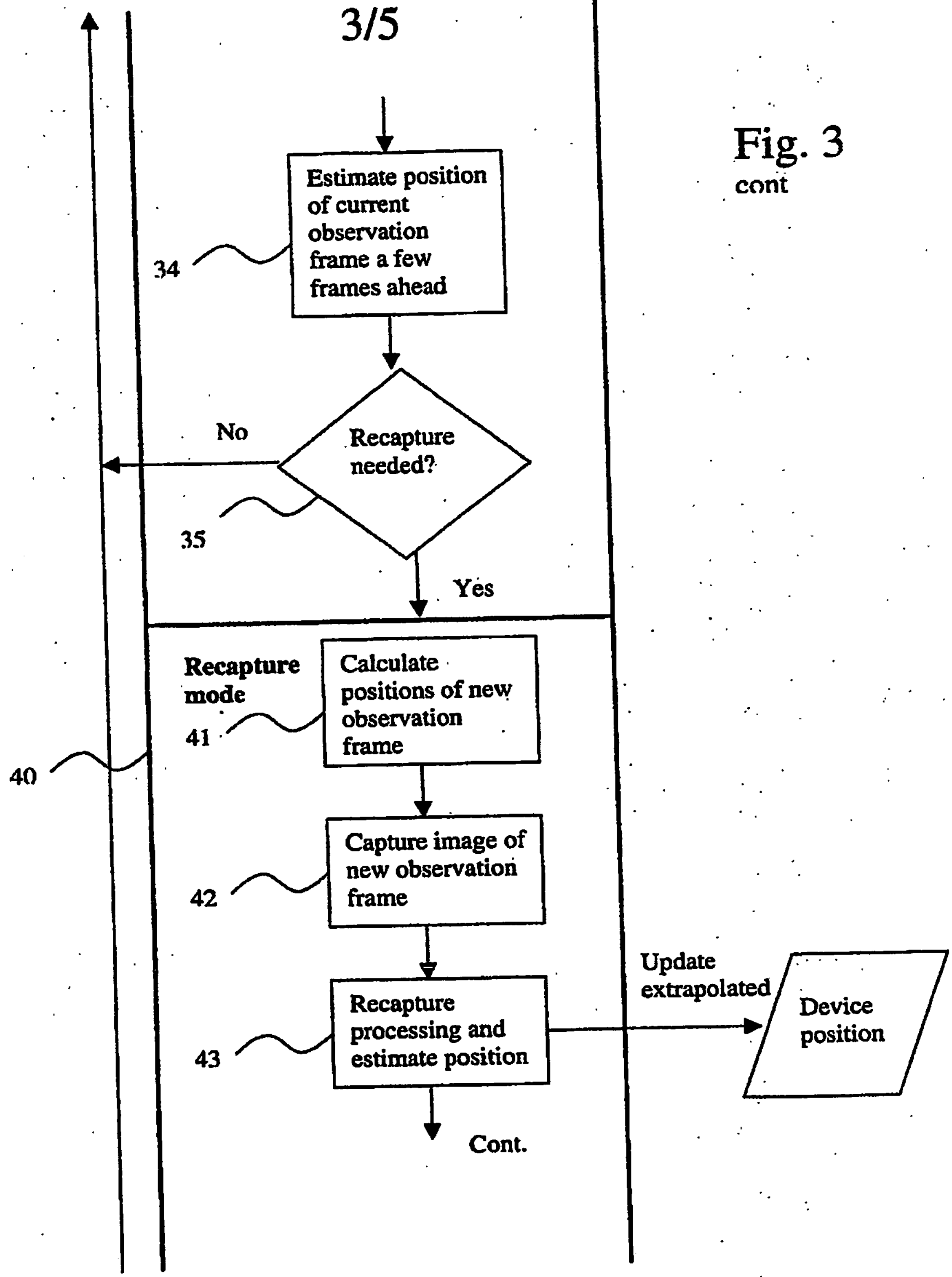

Estimate position of current observation frame a few frames ahead
34
Recapture needed?
35
No
Yes
Recapture mode
40
41
Calculate positions of new observation frame
42
Capture image of new observation frame
43
Recapture processing and estimate position
Update extrapolated
Device position
Cont.

Fig. 3 cont

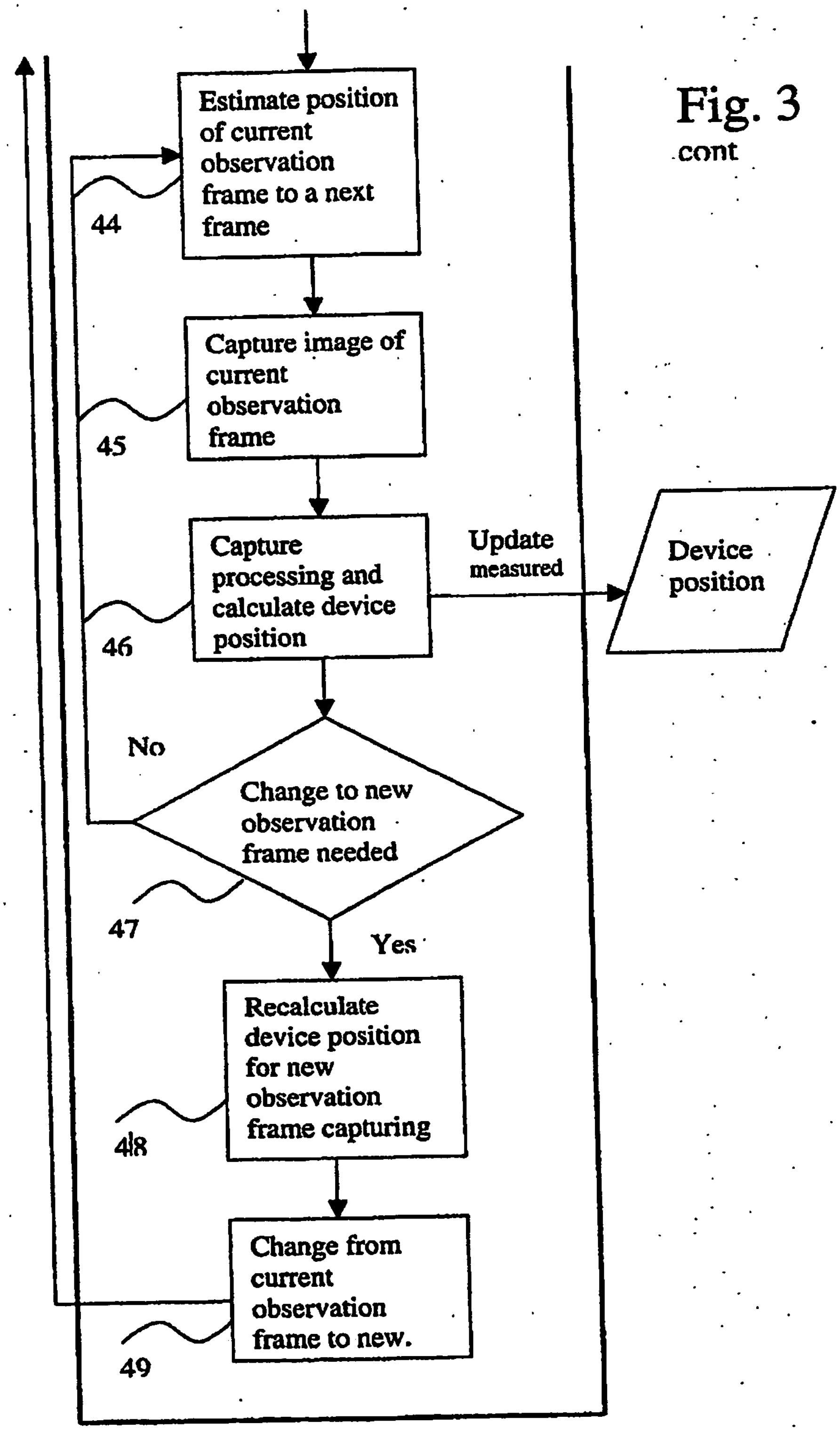

Estimate position of current observation frame to a next frame
44
Capture image of current observation frame
45
Capture processing and calculate device position
46
Update measured
Device position
No
Change to new observation frame needed
47
Yes
Recalculate device position for new observation frame capturing
48
Change from current observation frame to new.
49

Fig. 3 cont

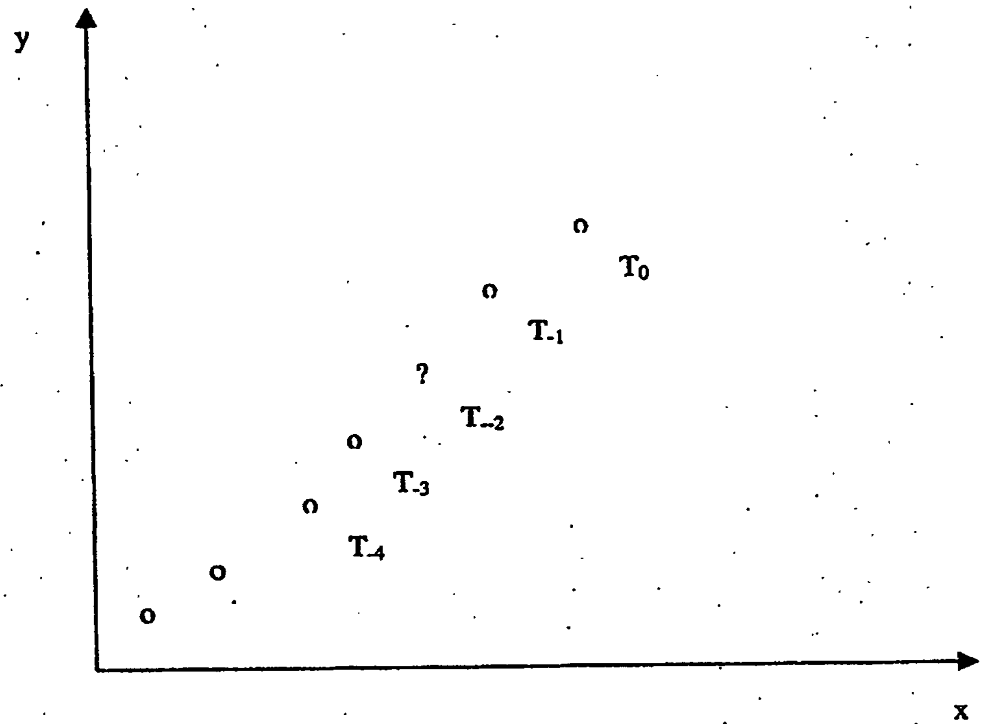


Fig. 4

PRV 301
Sid 1 av 2

PRV
PATENT- OCH REGISTRERINGSVERKET

Ansökan om svenskt patent

Ink. t. Patent- och re
2003 -03- 2
Huvudfaxen Kc

Bevis

Bekräftelse av faxansökan

Likalydande ansökningstext har ingivits via telefax

datum 2003-03-24

Avseende fullföljd internationell patentansökan

Internationell ingivningsdag

Internationellt ansökningsnummer

Uppfinningens benämning

DUKFÄSTE FÖR MOPPSTATIV

Sökande
Namn, adress och telefonnummer
För juridisk person anges organisationsnummer

INTER ERGO Svenska AB
Snickaregatan 8
671 33 ARVIKA

20030324 1 46992 230 0300

Uppfinnare
Namn, adress och telefonnummer

Lars Johnny Ensson
Storgatan 26
671 31 ARVIKA

Ombud
Namn, adress och telefonnummer

HYNELL PATENTTJÄNST AB
Patron Carls väg 2
683 40 HAGFORS/UDDEHOLM

Ombudets ref.nummer P1742-101

○ Undertecknande sökande ger härmed fullmakt till ovanstående svenska ombud att företräda mig i allt som rör denna patentansökan och i allt som rör det eventuellt beviljade patentet.

☒ Fullmakt lämnas separat

○ Generalfullmakt finns hos PRV
nr

Begäran om prioritet
Datum, land och ansökningsnummer

Vid avdelad eller utbruten ansökning
Stamansökningar

Begärd löpdag

Vid deposition av mikroorganismer
Depositionsmyndighet

Depositionsdatum

Depositionsnummer

PRV 301
Sid 2 av 2

PRV
PATENT- OCH REGISTRERINGSVERKET

Ink. t. Patent- och re
2003 -03- 2
Huvudfaxen Ka

Tjänster mot extra kostnad

○ Engelsk översättning av tekniskt föreläggande (se separat blankett)

Avgifter:

Ansökningsavgift:

⊗ Anmälningsavgift, *obligatorisk avgift*	*1 000*
⊗ Granskningsavgift, nationellt slag, *obligatorisk avgift*	*3 000*
○ Tilläggsavgift, granskning av internationellt slag (ITS). 5 720 kr	0
Tilläggsavgift, 150 kr för varje patentkrav utöver tio [ ] patentkrav utöver tio	0
○ Tilläggsavgift, två månaders frist för översättning. 500 kr (för fullföljd internationell patentsökan)	0
⊗ Diariebevis, 20 kr	+ 20
Summa	4020

Betalningssätt:

○ Postgiro 1 56 84-4 ○ Bankgiro 5050-0248 ◉ Check ○ Kontant ○ Depositionskonto [ ]

Bilagor

⊗ Beskrivning i två likalydande exemplar

⊗ Patentkrav i två likalydande exemplar

⊗ Sammandrag i två likalydande exemplar

⊗ [3] st. ritningsblad i två likalydande ex.

○ [ ] exemplar överlåtelsehandlingar

○ Fullmakt

○ Sekvenslista på diskett i EPO:s program Patent In

○ Prioritetsbevis

○ Engelsk översättning av tekniskt föreläggande

HYNELL PATENTTJÄNST AB

Ort och datum: Hagfors/Uddeholm 2003-03-24

Underskrift:

Angela Sjögren

Handläggare: Peter Kylin

DUKFÄSTE FÖR MOPPSTATIV

TEKNISKT OMRÅDE

Föreliggande uppfinning avser ett dukfäste för moppstativ dukfäste för moppstativ, omfattande en baskropp med ett första och ett andra fastsättningsorgan, för förskjutbar fastsättning vid ett moppstativ, och infästningsorgan, för infästning av en duk vid dukfästet.

KÄND TEKNIK

I vissa arbetsmoment som utförs med mopp används dukar, vilka då behöver kunna appliceras vid moppstativet på ett enkelt vis. För detta ändamål finns speciella dukfästen. Ur ergonomisk synvinkel ställs vissa krav på ett dylikt dukfäste. Dukfästet får inte vara speciellt tungt, eftersom det annars skulle medföra onödig extravikt. Vidare måste det vara lätt att applicera vid och ta bort från moppstativet samt möjligt att förskjuta längs moppstativet, för att kunna positioneras i olika lägen. Dessutom bör det vara utrustat med infästningsorgan som möjliggör en snabb applicering av ny duk respektive snabb lösgörning. Ett i dag ofta använt dylikt dukfäste har en baskropp som är gjort i strängsprutad aluminium. Själva infästningsorganen däremot, är gjorda i plast och är monterade i urtagningar i den strängsprutade baskroppen. Ett dukfäste utformat på detta vis medför vissa nackdelar. En första nackdel är att baskroppen enbart är utformad med förstärkningsribbor i en led, nämligen den led i vilken strängsprutningen sker. Detta innebär att baskroppen får en god böjstyvhet i en tvärriktning medan den i en motsatt tvärriktning får relativt begränsad böjstyvhet, genom att det enbart då är basskiktet ingående i baskroppen som kan motverka böjspänningar. Eftersom dukfästet måste vara relativt lätt måste basskiktets tjocklek vara relativt begränsad, vilket får till följd att böjstyvheten i baskroppen i denna tvärriktning är mycket begränsad. Som en följd härav, och materialet aluminiums begränsade elasticitet, är det lätt hänt att dukfästet plastiskt deformeras i denna riktning, vilket i sin tur får till följd att dukfästet kan förlora sitt grepp kring moppstativet. En annan nackdel är att infästningsorganen är anordnade vid baskroppen så att de utskjuter ovanför baskroppens övre yta och bildar därigenom en upphöjd kan som kan försvåra arbetet genom att hugga fast mot andra föremål, samt vilket ger moppstativet extra bygghöjd som kan omöjliggöra städning inunder låga föremål. Dessutom medför konstruktionen med löstagbara infästnings-organ att de, i vissa situationer, har benägenhet att trilla loss från baskroppen. Därutöver tillkommer att tillverkningen av ett dylikt dukfäste innebär relativt många arbets-operationer, strängsprutning, kapning, håltagning, framtagning av infästningsorgan, montage av infästningsorgan, etc., vilket leder till relativt höga kostnader.

KORT BESKRIVNING AV UPPFINNINGEN

Det är ett ändamål med föreliggande uppfinning att eliminera eller åtminstone minimera ovan nämnda problem, vilket åstadkommes medelst ett dukfäste för moppstativ, omfattande en baskropp med ett första och ett andra fastsättningsorgan, för förskjutbar fastsättning vid ett moppstativ, och infästningsorgan, för infästning av en duk vid dukfästet, varvid nämnda infästningsorgan är integrerade med nämnda baskropp och nämnda baskropp uppvisar i två tvärgående riktningar från kant till kant sig sträckande förstärkningselement.

Tack vare utformandet enligt uppfinningen vinner man många fördelar. För det första skapas en baskropp hos dukfästet som innefattar förstärkningselement anordnade i två tvärgående riktningar, så att god böjstyvhet erhålles i alla riktningar. Vidare erhålles ett dukfäste som eliminerar möjligheten att infästningsorganen kan falla ur. Därutöver innebär ett dukfäste enligt uppfinningen en väsentlig rationalisering i förhållande till nuvarande kända dukfästen genom att kunna tillverkas i en enda arbetsoperation.

Enligt ytterligare aspekter för uppfinningen gäller att:

- nämnda baskropp och nämnda infästningsorgan är gjorda i polymert material, företrädesvis samma polymera material,

- godstjockleken för den huvudsakliga delen av infästningsorganet väsentligen understiger den huvudsakliga godstjockleken för baskroppen,

- nämnda förstärkningselement är anordnade på undersidan av nämnda baskropp,

- ovansidan av dukfästet är anordnad i form av en jämn yta, att nämnda förstärkningselement är anordnade på undersidan,

- materialet i baskroppen har väsentligt högre elasticitetsmodul än aluminium,

- det på undersidan av baskroppen i området kring infästningsorganet finns anordnat ett cirkelformigt förstärkningselement,

- åtminstone en av nämnda sig från kant till kant sträckande förstärkningselement, är integrerade med nämnda cirkelformigt förstärkningselement,

- åtminstone ett av nämnda från kant till kant i sig sträckande förstärkningselement, utsträcker sig mellan nämnda första och andra fastsättningsorgan,

- nämnda fastsättningsorgan är anordnat i nämnda förstärkningselement.

KORT FIGURBESKRIVNING

I det följande kommer uppfinningen att beskrivas i mer detalj med hänvisning till bifogade figurer, i vilka:

Fig. 1 visar en föredragen utföringsform av ett dukfäste enligt uppfinningen sett i perspektiv snett från ovan,

Fig. 2 visar dukfästet enligt Fig. 1 sett snett underifrån i perspektiv, och

Fig. 3 visar ett snitt genom markeringen i Fig. 1.

DETALJBESKRIVNING

I Fig. 1 visas en föredragen utföringsform av ett dukfäste sett i perspektiv snett från ovan. Dukfästet består av en baskropp 2, vilket på integrerat vis anordnats med infästningsorgan 3 för en duk. Infästningsorganet 3 består av ett antal tunnväggiga flikar 31 (sex till antalet), vilka avskiljes från varandra medelst smala spalter 32. Baskroppen 2 har en utdragen U-formig tvärsnittsprofil. I den inåtriktade änden av vardera toppdel av U-elementet finns anordnat urtagningar 21, 21A, 21B, vilka tjänar som fastsättnings-organ, för att kunna anordna dukfästet 1 vid ett moppstativ (ej visat). Dessa fast-sättningsorgan, 21A, 21B är utformade i en förstärkningsribba 22, som löper längs dukfästets långsträckta kant. Av figuren framgår även att dukfästets längs L är väsentligt större än dess bredd B. Dukfästet är företrädesvis gjort i ett och samma material, vilket företrädesvis är ett lämpligt polymert material, som ger god elasticitet. Av figuren framgår också att den övre ytan av dukfästet är i princip helt kontinuerlig, dvs. att den inte uppvisar några diskontinuiteter i form av hack eller kanter, vilket är en fördel ur många aspekter.

I Fig. 2 visas en perspektivvy av dukfästet enligt Fig. 1 sett underifrån. Det framgår här att förutom de långsträckta förstärkningsribborna 22, finns även anordnat ett antal förstärkningsribbor 23 som utsträcker sig i tvärled i förhållande till nämnda längsgående förstärkningsribbor 22. Tack vare detta anordnande kan man erhålla materialbesparing och uppnå önskad hög böjstyvhet med hjälp av ribborna 22, 23. Vidare framgår att en cirkelformad förstärkningsribba 24 finns anordnad kring vart och ett av infästnings-organen 3. Åtminstone de yttre av de tvärgående förstärkningsribborna 23 är anordnade

så att de sammanfaller med den cirkelformiga förstärkningsribban 24, som på ett fördelaktigt vis fördelar uppstående böjspänningar kring infästningsorganet 3. Vidare visas att fastsättningsorganen 21A respektive 21B består av likformiga urtagningar i vart och ett av de längsgående löpande förstärkningsribborna 22. Tack vare den goda elasticiteten i materialet som används till baskroppen 2 kan dukfästet 1 snäppas fast vid ett moppstativ (ej visad), vilket underlättas genom att nederdelen kring fastsättningsorganen är anordnade med styrytor 25, vilka styrytor 25 således underlättar fastsnäppning av dukfästet 1. Det framgår även att de tvärgående förstärkningsribborna 23 löper från kant till kant, så att de vid sina ändar integreras med de längsgående förstärkningsribborna 22.

I Fig. 3 visas ett snitt igenom dukfästet enligt Fig. 1. Det framgår här att tjockleken t_1 hos delelementen 31 i infästningsorganet 3 har en tjocklek t_1 som är mindre än hälften så tjock jämfört med godstjockleken t_2 som används för baskroppen 2. Härigenom säkerställs att tillräckligt god flexibilitet skapas hos de fjädrande, tårtformade flikarna 31, vilket möjliggör enkel applicering av en duk. Vidare framgår med tydlighet av denna figur att övre ytan är i princip jämn, vilket medger många fördelar. Framförallt är det en fördel att ingen markerad kant bildas i baskroppens övergång till infästningsorganen 3, både ur handhavande respektive ur hygiens synvinkel. Dessutom framgår att de två inre tvärgående förstärkningsribborna 23 är placerade så att de tangerar och är integrerade med vart och ett av de ringformade förstärkningsribborna 24.

Uppfinningen är inte begränsad av det ovan visade utan kan varieras inom ramarna för de efterföljande patentkraven. Således inses att det i vissa utföringsformer kan vara fördelaktigt att använda två slags material för framställning av ett dukfäste 1 enligt uppfinningen, t.ex. genom ett två-stegs formgjutningsförfarande om t.ex. en kund önskar ett speciellt slags material i infästningsorganet 3 men ett annat i själva baskroppen 2. Vidare inses att rätlinjiga förstärkningsribbor 23, respektive 22 inte nödvändigtvis måste användas utan att det i vissa fall kan vara fördelaktigt med en annan slags förstärkningselement, t ex i form av diskreta åsar, eller i vissa fall genom att integrera vissa förstärkningselement så att de uppvisar en kontinuerlig materialutbredning. Vidare inses att dessa element inte behöver vara rätlinjiga utan t ex kan vara sinusformiga eller andra sätt som ger önskad hållfasthet. Vidare inses att förstärkningselementen i området för U-skänklarna inte behöver nå ända ut till yttre kanten. Det inses även att många olika slags material, företrädesvis polymer, kan nyttjas för att erhålla önskad flexibilitet/elasticitet.

PATENTKRAV

1. Dukfäste för moppstativ, omfattande en baskropp (2) med ett första (21A) och ett andra (21B) fastsättningsorgan, för förskjutbar fastsättning vid ett moppstativ, och åtminstone ett infästningsorgan (3), för infästning av en duk vid dukfästet (1), kännetecknat av att nämnda infästningsorgan (3) är integrerat med nämnda baskropp (2) och att nämnda baskropp (2) uppvisar i två tvärgående riktningar från kant till kant sig sträckande förstärkningselement (22, 23).

2. Dukfäste enligt patentkrav 1, kännetecknat av att nämnda baskropp (2) och nämnda infästningsorgan (3) är gjorda i polymert material, företrädesvis samma polymera material.

3. Dukfäste enligt patentkrav 2, kännetecknat av att godstjockleken (t_1) för den huvudsakliga delen (31) av infästningsorganet (3) väsentligen understiger den huvudsakliga godstjockleken (t_2) för baskroppen (2).

4. Dukfäste enligt något av ovanstående patentkrav kännetecknat av att nämnda förstärkningselement (22, 23) är anordnade på undersidan av nämnda baskropp (2).

5. Dukfäste enligt något av ovanstående patentkrav, kännetecknat av att nämnda förstärkningselement (22, 23) är anordnade på undersidan och att ovansidan av dukfästet (1) är anordnad i form av en jämn yta.

6. Dukfäste enligt något av ovan nämnda patentkrav, kännetecknat av att materialet i baskroppen (2) har väsentligt högre elasticitetsmodul än aluminium.

7. Dukfäste enligt något av ovanstående patentkrav, kännetecknat av att det på undersidan av baskroppen (2) i området kring infästningsorganet (3) finns anordnat ett cirkelformigt förstärkningselement (24).

8. Dukfäste enligt patentkrav 7, kännetecknat av att åtminstone en av nämnda sig från kant till kant sträckande förstärkningselement (23), är integrerade med nämnda cirkelformigt förstärkningselement (24).

9. Dukfäste enligt något av ovan nämnda patentkrav, kännetecknat av att åtminstone ett av nämnda från kant till kant i sig sträckande förstärkningselement (22), utsträcker sig mellan nämnda första (21A) och andra (21B) fastsättningsorgan.

10. Dukfäste enligt patentkrav 9, kännetecknat av att nämnda fastsättningsorgan (21) är anordnat i nämnda förstärkningselement (22).

SAMMANDRAG

Föreliggande uppfinning avser ett dukfäste för moppstativ, omfattande en baskropp (2) med ett första (21A) och ett andra (21B) fastsättningsorgan, för förskjutbar fastsättning vid ett moppstativ, och infästningsorgan (3), för infästning av en duk vid dukfästet (1), varvid nämnda infästningsorgan (3) är integrerade med nämnda baskropp (2) och att nämnda baskropp (2) uppvisar i två tvärgående riktningar från kant till kant sig sträckande förstärkningselement (22, 23).

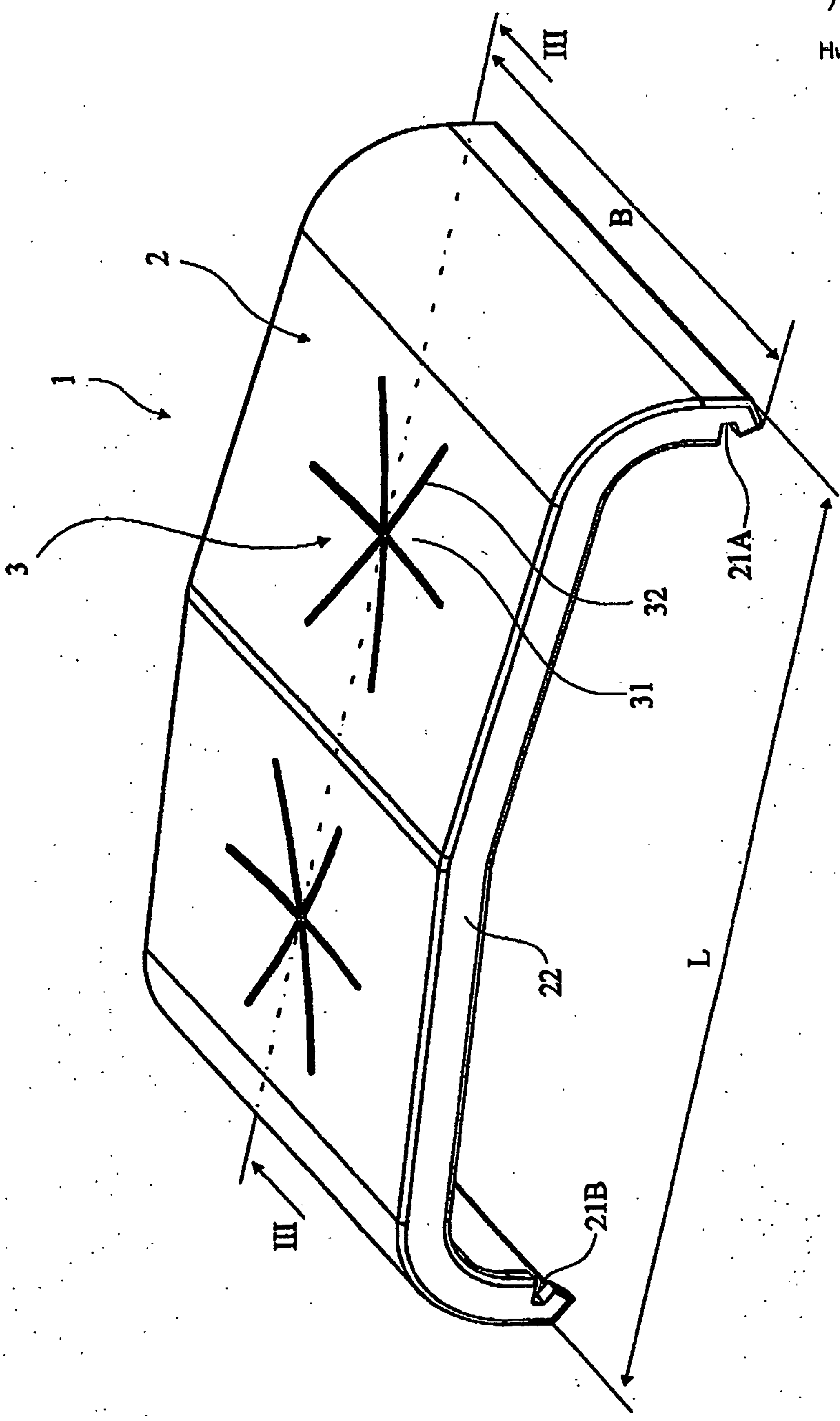


Fig. 1

2/3

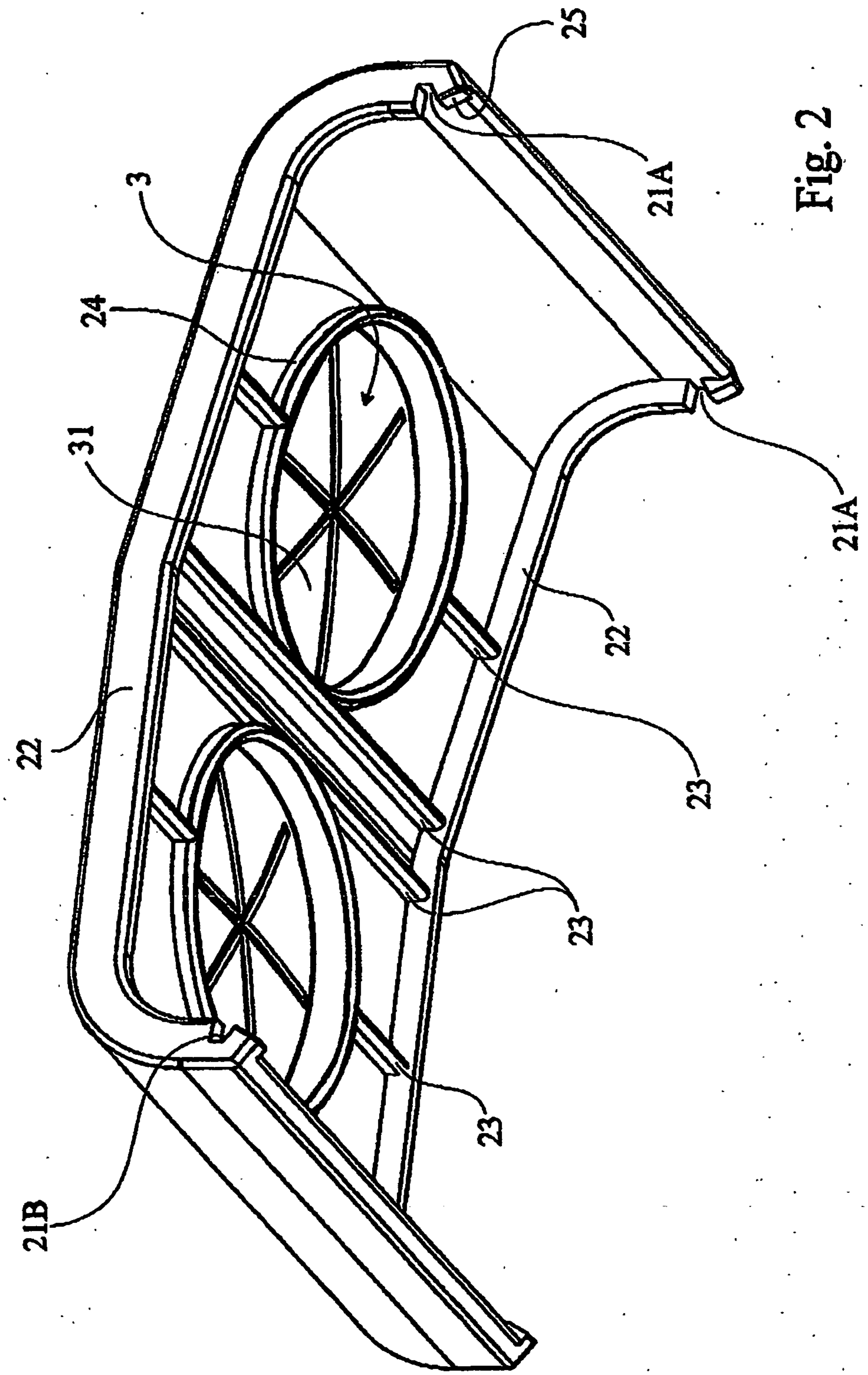


Fig. 2

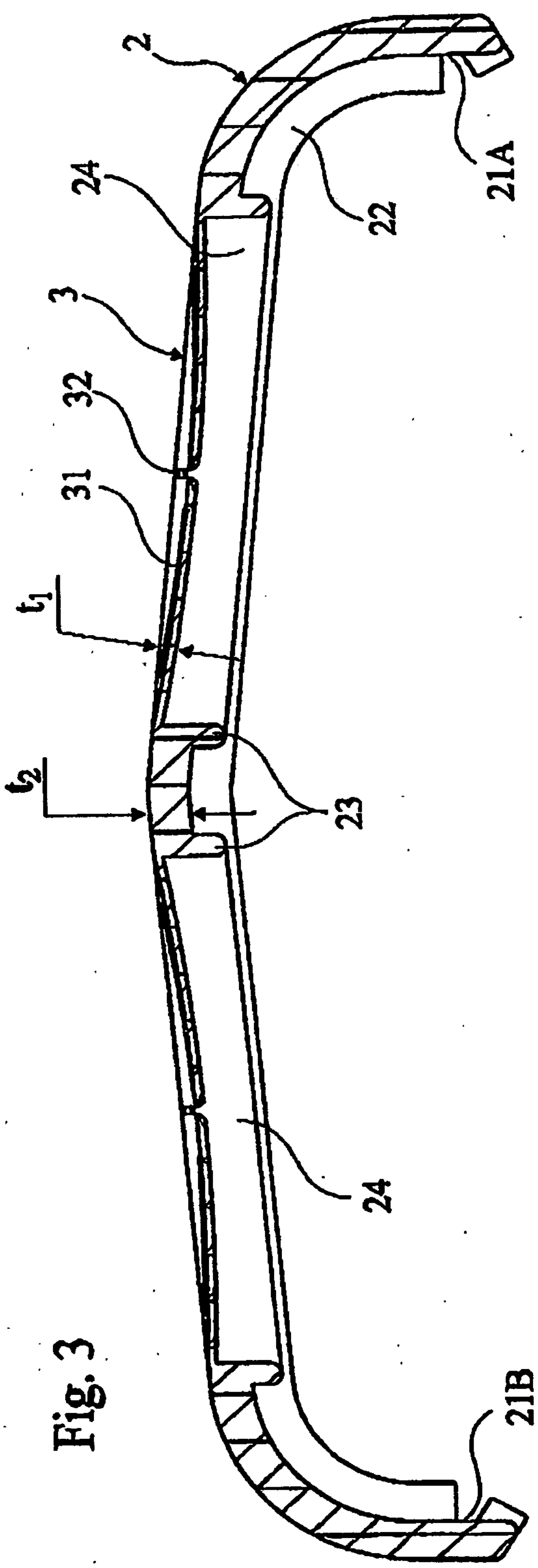


Fig. 3